(12) UK Patent Application (19) GB (11) 2 350 319 (13) A

(43) Date of A Publication 29.11.2000

(21) Application No 0019720.2

(22) Date of Filing 13.06.1997

Date Lodged 10.08.2000

(30) Priority Data
(31) 9612496 (32) 14.06.1996 (33) GB

(62) Divided from Application No 9826788.3 under Section 15(4) of the Patents Act 1977

(51) INT CL[7]
B42D 15/00

(52) UK CL (Edition R )
B6A AC31 AC41 ATC
B6C CSM
U1S S2272

(56) Documents Cited
GB 2191733 A DE 002532935 A

(58) Field of Search
UK CL (Edition R ) B6A ATC
INT CL[7] B42D 15/00
Online: EPODOC, PAJ, WPI

(71) Applicant(s)
De La Rue International Limited
(Incorporated in the United Kingdom)
De La Rue House, Jays Close, Viables, BASINGSTOKE, Hampshire, RG22 4BS, United Kingdom

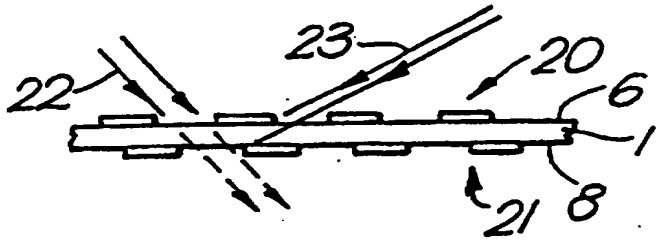
(72) Inventor(s)
Paul Howland
Kenneth John Drinkwater
Brian William Holmes

(74) Agent and/or Address for Service
Gill Jennings & Every
Broadgate House, 7 Eldon Street, LONDON, EC2M 7LH, United Kingdom

(54) Abstract Title
**Security device with dots on both sides of a substrate**

(57) A security device comprises a substrate 1 including a viewing region (Fig 1, 3) which is provided with first indicia 20 on one side of the substrate and second indicia 21 on the other side of the substrate overlapping the first indicia. The first and second indicia 20, 21 comprise dots. The device makes use of the thickness of the substrate to introduce a parallax effect between the first and second indicia. At one orientation 22 of viewing the substrate 1 from the one side under transmitted radiation, the first indicia 20 obscure the second indicia 22, and at another orientation 23 the second indicia 21 are visible through the first indicia 20.

Fig. 3




GB 2 350 319 A

Fig.1.

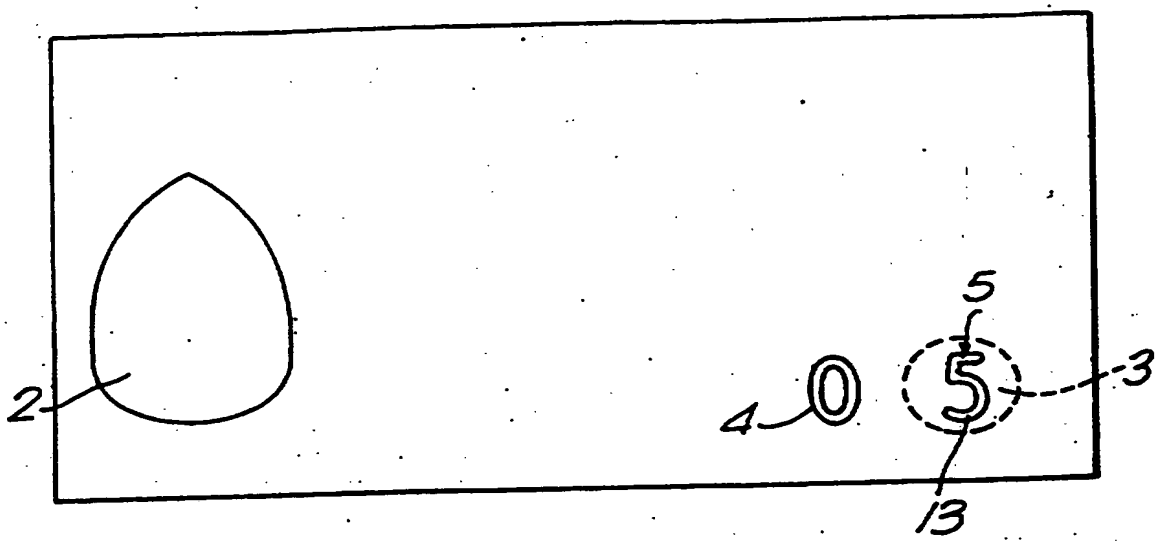


Fig. 2

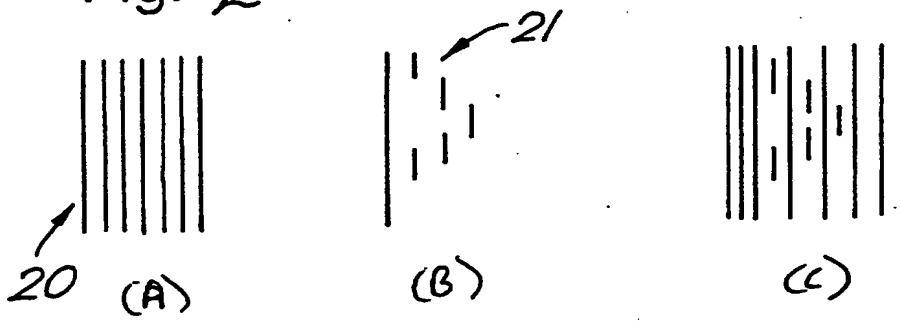



Fig. 3

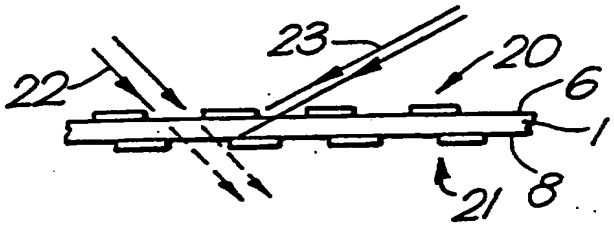



Fig. 4

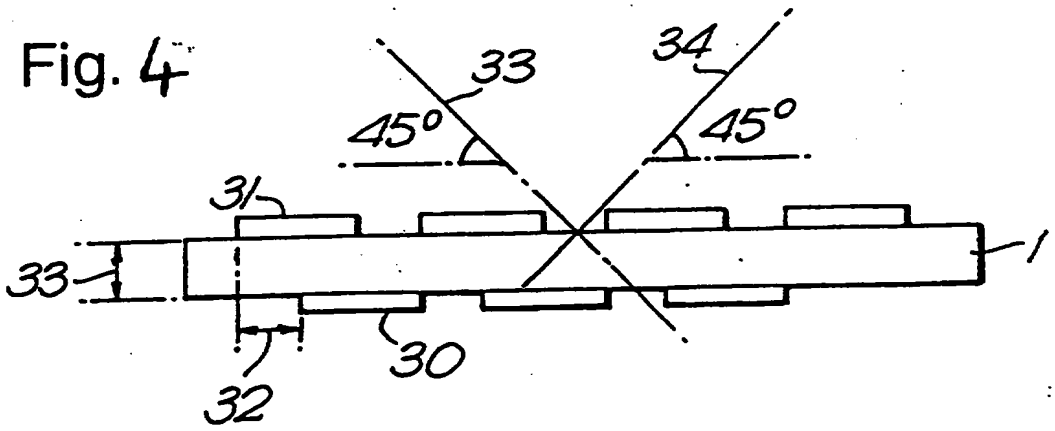


Fig. 5

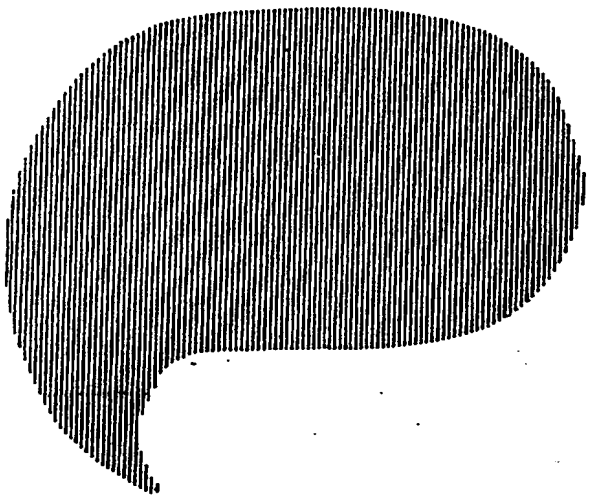


Fig. 6

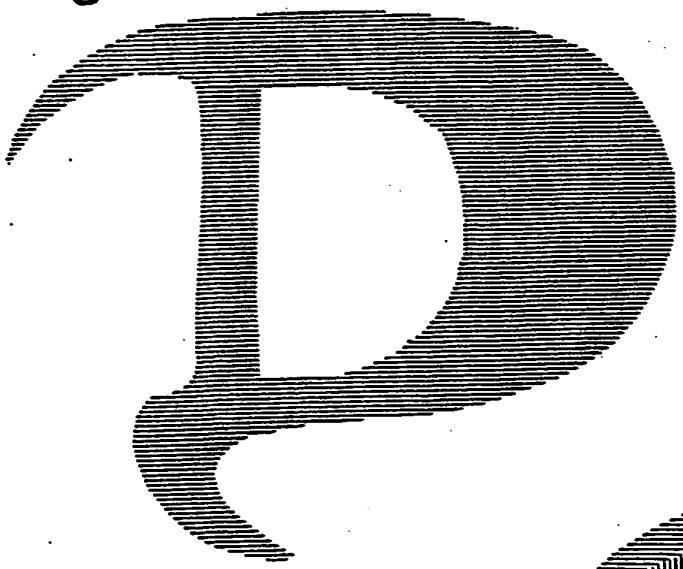
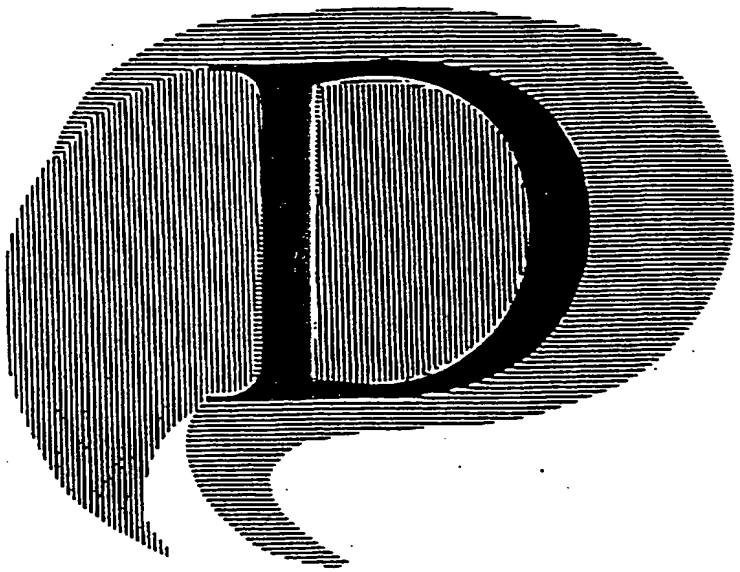


Fig. 7



# SECURITY DEVICE

The invention relates to security devices, particularly for use with documents of value.

In the field of security documents, such as banknotes and the like, there is a continuing need to incorporate security devices which prevent such security documents from being counterfeited using the increasingly sophisticated commercial printing equipment which is available.

Examples of security devices which have been used in the past include complex patterns printed on the document, optical devices such as diffraction gratings and holograms and the like.

For certain translucent papers a security feature which involves providing (usually printing) an image on both sides of the paper was developed many years ago. In one form, herein defined as a "see-through" feature, complementary images are provided on each side of the sheet precisely registered relative to one another such that when the sheet is held up to the light, the image on the back will fit exactly into spaces within the image on the front, optionally with an even unprinted margin around the perimeter. For example, each image could comprise a series of coloured segments, segments on one side of the sheet fitting within the spaces between the segments on the other. Printing of these images is normally carried out with specialised lithographic presses which allow simultaneous front and back printing during one printing run. In this way, the tolerances applied to the design elements are typically a fraction of a millimetre and any variation caused by counterfeiting by printing both sides during different printing runs can be quickly noticed. By printing on both sides in a single impression, misregister due to variations in the dimensions of the sheet caused by change of moisture content or heating and the like are avoided. See-through features have four modes of visual inspection - the first image viewed in reflected light, the

image on the other side of the sheet viewed in reflected light, the composite image viewed by transmitted light as viewed from the first side and with the image on that side predominating, and finally the composite image as viewed on the other side of the sheet with the image on that side predominating. On transmissive viewing of see-through features the image on the opposite side of the sheet is seen to be in register in a genuine document.

An example of see-through features used with banknotes and the like is described in EP-A-0388090 in which the feature is provided in a region of the sheet which has a substantially uniform transparency which is more transparent than a majority of the remainder of the sheet in the absence of applied ink.

DE-A-3208004 describes the use of periodic lineal point patterns on opposite sides of a sheet which, when viewed in transmission, produce a characteristic moire pattern indicating that the sheet is genuine.

GB-A-2282563 illustrates the use of apparently random patterns of dots at opposite sides of the sheet which, when viewed in transmission, generate a recognisable pattern.

EP-A-0628408 relates to the inclusion of a printed layer, laminated between two paper sheets, the print only being visible in transmitted light. The image may be registered to an image on one of the outer layers in a cooperative way so as to form a complete image.

EP-A-0755799 relates to a letterpress printing technique that autoregisters a fluorescent image on one side of a document to a letterpress image on the other side.

WO 94/29119 describes an embossed structure that is designed to give a switching effect across a transparent zone. The effect is due to light being reflected as a consequence of the angle of incidence either exceeding or not exceeding the critical angle as a consequence of the embossed surface. This results in light either being reflected off the surface or being allowed to pass through.

The effect is obtained when the embossed pattern on the front side exactly coincides with the reverse side pattern.

US-A-4307899 describes a process for creating watermark effects on cards rather than paper. In this case, multiple layers of print are produced either by overprinting or lamination. The overlapping layers interact in transmitted light to give an image with light intensity gradients rather like a watermark. These may be in colour or in grey tones alone. The key point is that the objective is to produce a watermark-like effect, optionally complimented by extra dimension such as fluorescence or colour.

DE-A-2532935 describes a process for manufacturing documents of value such as identity cards having a plurality of film transparent material, a screened design consisting of a plurality of lines being printed on at least two of the films.

The primary advantage of see-through features is the difficulty in counterfeiting such features. Partly, this is due to the need to achieve exact registration between the indicia on each side of the sheet and partly due to the fact that the counterfeiter may not even realise that the feature exists.

One of the problems which can arise when using see-through features is that on the one hand it is necessary to incorporate the indicia on each side of the substrate in a region of the substrate which is relatively transparent or translucent to enable both indicia to be viewed in transmission, while on the other hand the more translucent the region, the easier it is to see both indicia when viewed in reflected light. If the indicia on both sides of the substrate are visible in reflected light this clearly diminishes the value of the see-through feature because there is no longer a readily recognisable contrast between the images seen in reflected and transmitted light.

One approach to solve the problem would be to provide one set of indicia at a high intensity relative to the

other indicia so as to obscure the second indicia when the device is viewed in reflection. However, this is not satisfactory in many cases.

In accordance with the present invention, a security device comprises a substrate including a viewing region which is provided with first indicia on one side of the substrate and second indicia on the other side of the substrate overlapping the first indicia, wherein at one orientation of viewing the substrate from the one side under transmitted radiation, the first indicia obscure the second indicia, and at another orientation the second indicia are visible through the first indicia and is characterised in that the first and second indicia comprise dots.

This new see-through security device makes use of the thickness of the substrate to introduce a parallax effect between the first and second indicia.

This is an effect not previously used as a security feature. It is a potentially very powerful security feature by virtue of its difficulty to counterfeit and its ability to be clearly seen by the general public. It is not immediately apparent that such a combination would be clearly visible because of the distorting effect of diffraction and the limited resolving sensitivity of the eye. However, by careful choice of the configuration of the first and second indicia, these potential limitations can be overcome.

In a simple example, each of the first and second indicia comprise dots which at the one orientation of viewing are in alignment with one another so that the second indicia cannot be seen but in the other orientation the second indicia are visible through the gaps between the dots of the first indicia.

Preferably, the second indicia define a recognisable image so that by changing the orientation of the security device, the image is either obscured or visible.

Either or both of the first and second indicia can in themselves constitute a recognisable image which further may be associated with further indicia on the substrate.

The use of dots means that viewing can be achieved in a variety of orientations.

In a particularly preferred example, each of the first and second indicia comprise a mixture of lines and dots. On varying the orientation of viewing of such a device, a variety of different images will be presented. This is particularly difficult to counterfeit because of the demanding registration accuracy required of both the front and back side print.

In a preferred arrangement, the one orientation of viewing is constituted by viewing the one side of the substrate normally although in other arrangements normal viewing could constitute the other orientation so that the second indicia are visible upon normal viewing and not when viewed at an angle to the normal.

Typically, the thickness of the substrate in the viewing region will be of the same order of magnitude as the width of dots constituting the first and second indicia.

In many cases, the indicia will be provided in a single colour. However, further enhancements can be achieved by providing the first indicia and second indicia in different colours. This can lead to the result that on viewing the device at different angles, up to three different colours can be seen corresponding to the colours of the first and second indicia individually and the result of combining those colours.

In addition, although the substrate will normally comprise an item to be authenticated, the security device could be provided in use on a region of a support through which radiation can be transmitted, the substrate comprising a transparent material which overlies the second indicia and on which is provided the first indicia.

A high level of transparency is advantageous since it allows the use of relatively low intensity indicia involving for example light pastel colours and the use of fine line structures which cannot normally be distinguished due to problems of light diffusion as light passes through the substrate. Light pastel colours are desirable because they are more difficult for a counterfeiter to faithfully reproduce with a colour copier, printer or scanner.

The term "indicia" refers to all localised constructions whether they be of an abstract, geometric or a representational nature. In some cases, the interaction between two indicia on each side of the substrate may be limited to only a small fraction of the area covered by each individual indicia.

The radiation used for viewing the indicia would typically be in the visible light range but could include radiation outside the visible range such as infrared or ultraviolet. These latter wavelength ranges increase the security of the feature by hiding the device from the average user. Furthermore, one or both of the indicia may define machine readable images, and may only be detectable outside the visible wavelength range.

In the preferred arrangement the first and/or second indicia is associated with further indicia on the same side of the substrate adjacent the viewing region. This makes it much more difficult for a counterfeiter to duplicate an item carrying the security device since he must associate the device with the further indicia.

Typically, the further indicia and associated first or second indicia define a security pattern extending across the viewing region and into part of the substrate surface adjacent the viewing region. Counterfeiting of this arrangement would require very accurate registration.

The term "association" is also intended to include other forms of association such as a juxtaposition of different patterns, one or more of which is defined by the first and/or second indicia and the remainder by the

further indicia. An example would be a word in which one or more of the letters was defined by the first and/or second indicia and the remaining letters by the further indicia.

Preferably, the first and second indicia together define a characteristic image. This enables the device easily to be authenticated either by the eye or by a machine in the case of a machine readable image.

The image can have any form which is recognisable including geometric shapes, line patterns, alphanumeric characters and the like. Once again, in preferred examples the image is associated with further indicia on the substrate adjacent the viewing region. This increases the difficulty of counterfeiting.

The challenge facing the counterfeiter with see-through security features is two fold. First to correctly register the front and reverse side indicia. Second, to register elements of the indicia or associated secondary indicia that are a different colour. By making the feature more visible and memorable (as achieved by the present invention), failure to achieve these technical challenges leaves the counterfeiter open to discovery. This is not the case to the same extent with the more traditional see-through features previously described because they are easier to reproduce and less discernable to the general public due to the high opacity of the substrate.

In most cases, the substrate will form part of the item to be protected such as a document of value. In some cases, the entire substrate will be sufficiently transparent or translucent to the appropriate radiation but in the preferred arrangement, the substrate is more transparent in the viewing region than elsewhere (in the absence of applied ink) as described more fully in EP-A-0388090.

This area of greater transparency will be formed typically during manufacture of the substrate as described

in GB-A-2282611 and GB-A-2283026 or it could be formed during a post processing operation.

In other cases, the device could be constructed separately from the item or support to which it is to be affixed, the device being provided in use on a region of a support through which radiation can be transmitted, the substrate comprising a transparent material which overlies the second indicia and on which is provided the first indicia.

In these cases, the substrate can comprise a varnish or lacquer while the second indicia may be provided on the support or on the underside of the substrate.

In all cases, the first and/or second indicia can be provided by printing such as offset, gravure or screen printing or by any other suitable technique such as a transfer process.

The substrate will typically be a paper such as rag paper and the like but could also comprise a plastics material such as a plastics film or other material such as credit card material, non-wovens and the like. In one application, the viewing region is defined by a plastics material which is located within a sheet such as a paper sheet during manufacture of the sheet.

In a particularly preferred arrangement, one or more of the colours could be fluorescent so that they are only visible in ultraviolet light.

Some examples of security devices according to the invention will now be described with reference to the accompanying drawings, in which:-

Figure 1 is a schematic plan of a banknote carrying a security device;

Figure 2 is a view showing a see-through device with an appearance which varies with orientation of viewing;

Figure 3 is a cross-section through a device of the type shown in Figure 2;

Figure 4 is a view similar to Figure 3 but of another device;

Figures 5 and 6 illustrate first and second indicia of a further device; and,

Figure 7 illustrates the appearance of the device of Figures 5 and 6.

Figure 1 illustrates a document of value such as a banknote 1 containing a graphical watermark 2 of conventional form illustrated in outline and a viewing region 3 having an area of even transparency which is more transparent than surrounding areas of the banknote. The banknote 1 will carry conventional printing (not shown) including a character "0" illustrated at 4 adjacent the viewing region 3.

A see-through security device 5 is located within the viewing region 3.

Typically, the viewing region 3 will comprise a more transparent part of the substrate forming the banknote 1 but in some cases it could be defined by a plastics insert within a surrounding paper support. In addition, the banknote 1 could comprise a plastics substrate.

Figure 2 illustrates schematically the basis of a see-through feature which takes advantage of the thickness of a substrate to achieve an effect which varies depending upon the orientation of viewing. In this example, the first indicia 20 printed on the surface 6 of the banknote 1 comprises a set of parallel lines (Figure 2A). The second indicia 21 printed on the surface 8 of the banknote 1 comprises a set of lines having the same lateral spacing as the lines of the first indicia 20 but arranged to define an image, in this case the letter "P" (Figure 2B).

In a first example, the lines of the second indicia 21 are printed directly underneath the lines of the first indicia 20. Thus, when the surface 6 of the banknote 1 is viewed normally, the lines of the first indicia 20 will obscure the lines of the second indicia 21. However, when the banknote 1 is tipped in a direction perpendicular to the direction of the lines of the first indicia 20, the

second indicia 21 will appear in the spaces between the lines of the first indicia as shown in Figure 2C.

A second example based on this effect is shown in cross-section in Figure 3. In this case, the lines of the first and second indicia 20,21 have a width equal to twice the thickness of the substrate 1 with the lines of the second indicia 21 being printed laterally offset by half the width of a line relative to the lines of the first indicia 20. With this arrangement, when the surface 6 of the banknote 1 is viewed in a direction 22 the second indicia 21 will be obscured by the first indicia 20 but when the banknote is oriented so that it is viewed in the direction 23 both the first and second indicia 20,21 will be visible. Each viewing direction is at about 45° to the normal. This is a particularly preferred arrangement in that it is relatively straightforward to inspect the device for authenticity but it is difficult to counterfeit the device in view of the requirement for precise registration between the two sets of indicia and accurately defined line widths.

A third example is shown in cross-section in Figure 4. In this case, the reverse lines 30 are offset from the lines 31 closest to the viewer by a distance 32 substantially equal to the thickness 33 of the substrate. In this configuration, the image formed by the reverse lines 30 is obscured when the substrate is viewed at 45° to the substrate in the direction indicated at 33. The image is visible when the substrate is viewed at 45° from the other side as indicated at 34.

The following example demonstrates the principle of the examples shown in Figures 2 to 4.

a) A sample of 100$\mu$m thick plastic film was suitably treated so as to make its surface printable and was printed by dry offset printing to produce a fully registered and visible indicia on the back and front sides of the film. The film was rectangular.

b) The front side indicia comprised a set of parallel, horizontally oriented sinusoidal, lines, having a vertical amplitude of 2mm and a periodicity of 3mm and filling a circular area with a radius of 8mm. The lines were 200$\mu$m wide and were separated by distance of 100$\mu$m. In this case, the term "horizontal" refers to an orientation parallel to the long side of the rectangular document.

c) The back side indicia comprised a set of lines identical to those of the top side indicia and identically positioned in relation to the top side with the exception of a 100$\mu$m vertical offset relative to the lines of the top side indicia and limited to a triangular area whose corners were each coincident with the perimeter of the top side circular indicia. The lines were 200$\mu$m wide and were separated by distance of 100$\mu$m. The lines were vertically offset in relation to those of the top side indicia by a distance of 100$\mu$m.

d) The document thus printed was viewed in several ways. First it was held with the long side horizontal and the top side indicia facing the viewer. The top of the document was tilted away from the viewer causing the viewing angle to be 45°. The front side indicia entirely obscured the back side indicia. Only the top side circular area was visible.

e) Next, holding the document with the long side horizontal and the top side indicia facing the viewer, the top of the document was tilted towards the viewer causing the viewing angle to be 45°, both the front side indicia and the back side indicia were now clearly visible.

f) Attempts to reproduce this effect by photocopying the see-through feature usually

failed because registration of the two indicia was not accurate enough to consistently obtain the effect described above. This see-through feature therefore successfully increased the counterfeiting difficulty of the document.

In the examples shown in Figures 2 to 4 each set of indicia comprises a set of lines and it will be seen that the variation and appearance can only be generated by tilting the banknote 1 in a direction perpendicular to the line direction.

According to the invention the first and second set of indicia define dots. With dot structures, when the banknote is viewed normally, only the first indicia will be visible but the banknote can be tilted in any direction to reveal the dots of the second indicia.

A particularly preferred arrangement involves first and second indicia defined by a combination of lines and dots.

A typical thickness for the substrate 1 is 110 microns.

The examples shown in Figures 2 to 4 could involve providing the first and second indicia 20,21 in different colours so as to achieve colour variation effects.

An example of a security device using overlapping coloured indicia will now be described.

a) A rectangular sample of waterleaf banknote paper similar in size to a banknote was printed with a transparentising resin design illustrated by the outline of Figure 7, and sized in the manner described in GB-A-2282611.

b) An indicia with a design shown in Figure 5, was printed by the dry offset printing process in light blue on the front of the paper sample over the transparentised area and covered with an area approximately of 100 square mm.

c) A red indicia with a design shown in Figure 6 (as viewed from the front side) was printed in

the same manner as before on the reverse side of the paper. The two indicia were accurately registered so as to overlap, the overlapping region being illustrated in Figure 7.

d) The see-through feature was then viewed in several ways. First the front side was viewed in reflected light with the light source and the viewer on the same side of the sample. Only the front side indicia was clearly visible. The front side was then viewed in transmitted light with the sample between the light source and the viewer. In this case, three images became visible. The blue front side indicia, the red back side indicia and a purple indicia in the form of a letter "D" generated from the overlapping front and back indicia. This was a surprising and eye catching effect.

e) Attempts to reproduce this feature with toner based printing methods failed because the toner was optically too dense and caused the combined image to appear black. Attempts to reproduce the effect with other office printing methods also usually failed due to the difficulty to register the two indicia with sufficient accuracy. Furthermore, if the colour intensity was too high the combined image appeared to be black instead of purple and if the colour density was too low the reverse side indicia was obscured by the relatively higher opacity of the paper. The see-through feature therefore successfully increased the counterfeiting difficulty of the document.

CLAIMS

1. A security device comprising a substrate including a viewing region which is provided with first indicia on one side of the substrate and second indicia on the other side of the substrate overlapping the first indicia, wherein at one orientation of viewing the substrate from the one side under transmitted radiation, the first indicia obscure the second indicia, and at another orientation the second indicia are visible through the first indicia, characterised in that the first and second indicia comprise dots.

2. A device according to claim 1, wherein the one orientation of viewing is constituted by viewing the substrate normally.

3. A device according to any of the preceding claims, wherein the first and second indicia are provided in different colours.

4. A device according to claim 3, wherein one or both of the first and second indicia are provided in more than one colour.

5. A device according to any of claims 1 to 4, wherein the first and/or second indicia individually and/or together define an image.

6. A device according to claim 5, wherein the image has a shape corresponding to a recognisable symbol whereas the first and second indicia do not represent recognisable symbols.

7. A device according to claim 5 or 6, wherein the image comprises one of a pattern, shape or alphanumeric character.

8. A device according to any of the preceding claims, wherein the first and/or second indicia is associated with further indicia on the same side of the substrate adjacent the viewing region.

9. A device according to claim 8, wherein the further indicia and associated first or second indicia define a

security pattern extending across the viewing region and into part of the substrate surface adjacent the viewing region.

10. A device according to claim 8, wherein the image and further indicia define together a recognisable pattern, shape or alphanumeric character.

11. A device according to any of the preceding claims, wherein the viewing region, prior to being provided with the first and second indicia, has a higher transparency than adjacent regions of the substrate.

12. A device according to claim 11, wherein the viewing region was created during manufacture of the substrate.

13. A device according to any of the preceding claims, wherein one or both of the first and second indicia is printed.

14. A device according to any of the preceding claims, the device being adapted to be viewed in visible light.

15. A device according to any of the preceding claims, wherein the substrate comprises a document of value, for example a banknote.

16. A device according to any of claims 1 to 14, wherein the security device comprises a self-supporting element for adhering to a support.

17. A device according to any of claims 1 to 14 in combination with a support, the device being provided on a region of the support through which radiation can be transmitted.

18. A device in combination with a support according to claim 17, wherein the substrate comprises a varnish or lacquer.

19. A device substantially as hereinbefore described with reference to any of the examples shown in the accompanying drawings.

**Application No:** GB 0019720.2
**Claims searched:** 1-19

**Examiner:** Conal Clynch
**Date of search:** 18 September 2000

# Patents Act 1977
# Search Report under Section 17

**Databases searched:**

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.R): B6A (ATC)

Int Cl (Ed.7): B42D 15/00

Other: Online: EPODOC, PAJ, WPI

**Documents considered to be relevant:**

| Category | Identity of document and relevant passage | | Relevant to claims |
|---|---|---|---|
| Y | GB 2191733 A | (Transac) see page 1 lines 64-79 | 1 at least |
| Y | DE 2532935 A | (Noprint) see Fig 1 & page 3 lines 2-16 & page 4 lines 11-19 | 1 at least |

| | | | |
|---|---|---|---|
| X | Document indicating lack of novelty or inventive step | A | Document indicating technological background and/or state of the art. |
| Y | Document indicating lack of inventive step if combined with one or more other documents of same category. | P | Document published on or after the declared priority date but before the filing date of this invention. |
| & | Member of the same patent family | E | Patent document published on or after, but with priority date earlier than, the filing date of this application. |